

What is claimed is:

1. A system for heating transmission fluid, comprising:  
an oil pan secured to a transmission case for containing hydraulic fluid,  
including a surface at least partially enclosing the fluid within the oil pan;  
5 a supply duct for carrying exhaust gas from an engine;  
a heat exchanger secured to the oil pan, communicating through a first  
connection with the supply duct, and defining a flow path of exhaust gas along the  
surface through the heat exchanger for transferring heat from the exhaust gas to fluid  
contained in the oil pan;  
10 an exhaust duct communicating through a second connection with the supply  
duct, and connected to the heat exchanger for carrying engine exhaust gas from the  
heat exchanger to the supply duct; and  
a valve located between the first connection and second connection for opening  
and closing the supply duct to the flow of exhaust gas between the first connection and  
15 second connection.
2. The system of claim 1, further comprising:  
an engine exhaust manifold; and  
a catalytic converter for connection to the engine exhaust manifold, and located  
20 in an exhaust gas flow path between the engine exhaust manifold and first connection.
3. The system of claim 1, wherein closing the valve directs exhaust gas  
through the first connection to the heat exchanger, and opening the valve causes  
exhaust gas to bypass the heat exchanger.
- 25 4. The system of claim 1, wherein the heat exchanger further comprises:  
surfaces enclosing the exhaust gas in the heat exchanger, the heat exchanger  
having an opening bounded by the enclosing surfaces, the opening being closed by the  
surface of the oil pan.

5. The system of claim 1, wherein the heat exchanger further comprises:  
surfaces enclosing the exhaust gas in the heat exchanger, the heat exchanger  
having an opening bounded by the enclosing surfaces, the opening being at least  
5 partially closed by the surface of the oil pan;  
an inlet port passing through a surface of the heat exchanger and communicating  
with the supply duct;  
an exhaust port passing through a surface of the heat exchanger and  
communicating with the supply duct; and  
10 a baffle located between the inlet port and exhaust port for directing flow of  
exhaust gas in the heat exchanger along the surface of the oil pan.

6. A system for heating transmission fluid, comprising:  
an oil pan for containing hydraulic fluid supplied to a transmission;  
15 a supply duct for carrying exhaust gas from an engine;  
a heat exchanger secured to the oil pan, communicating with the supply duct,  
and defining a flow path of exhaust gas along a surface of the oil pan, for transferring  
heat from the exhaust gas to the oil pan;  
an exhaust duct communicating with the supply duct, and connected to the heat  
20 exchanger for carrying engine exhaust gas from the heat exchanger to the supply duct;  
and  
a valve directing exhaust gas to the heat exchanger from the exhaust duct, and  
for bypassing exhaust gas flow to the heat exchanger.

7. The system of claim 6, further comprising:  
an engine exhaust manifold; and  
a catalytic converter connected to the engine exhaust manifold and supply duct.

8. The system of claim 6, wherein the heat exchanger further comprises:

surfaces enclosing the exhaust gas in the heat exchanger, the heat exchanger having an opening bounded by the enclosing surfaces, the opening being closed at least partially by a surface of the oil pan.

- 5           9.       The system of claim 6, wherein the heat exchanger further comprises:  
surfaces enclosing the exhaust gas in the heat exchanger, the heat exchanger having an opening bounded by the enclosing surfaces, the opening being at least partially closed by the surface of the oil pan;  
an inlet port passing through a surface of the heat exchanger and communicating  
10 with the supply duct;  
an exhaust port passing through a surface of the heat exchanger and communicating with the supply duct; and  
a baffle located between the inlet port and exhaust port for directing flow of exhaust gas in the heat exchanger along the surface of the oil pan.

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10.   A system for controlling transmission fluid temperature in a power transmission of an motor vehicle, comprising:  
an oil pan for containing hydraulic fluid supplied to the transmission;  
a supply duct for carrying exhaust gas from an engine;  
20 a heat exchanger secured to the oil pan, communicating with the supply duct, and defining a flow path of exhaust gas along a surface of the oil pan, for transferring heat from the exhaust gas to the oil pan;  
an exhaust duct communicating with the supply duct, and connected to the heat exchanger for carrying engine exhaust gas from the heat exchanger to the supply duct;  
25 a valve having multiple states for directing exhaust gas to the heat exchanger from the exhaust duct, and for bypassing exhaust gas flow to the heat exchanger;  
a controller supplied with information including the current fluid temperature and a target temperature, comparing the fluid temperature to the target temperature, and producing a command signal to change the state of the valve in response to the

determination to maintain the fluid temperature equal to or greater than the target temperature.

11. The system of claim 10 further comprising:

5 a sensor producing a signal as input to the controller representing the fluid temperature; and

an actuator for changing the state of the valve in responsive to the command signal.

10 12. The system of claim 10, wherein the states of the valve includes an opened state for directing exhaust gas to the heat exchanger from the exhaust duct, and a closed state for bypassing exhaust gas flow to the heat exchanger.

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